

Appl. No. 10/523,170
Reply to Office Action of July 11, 2006

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REMARKS/ARGUMENTS

A new ABSTRACT is presented hereinabove, as required.

Claim 1 is rejected as fully anticipated by Kurimura et al.
The other claims are rejected as obvious over Kurimura et al.
combined with secondary art. Claims 6-16 are canceled. The
remaining claims depend from claim 1.

Claim 1 is amended to incorporate the following new
features:

(a) The wavelength converter has quartz type optical fibers
between the light coupling device and the quasi-phase matched
quartz crystal as well as after the quasi-phase matched quartz
crystal.

(b) The quasi-phase quartz crystal comprises an optical
waveguide with a periodically inverted sign of the nonlinear
optical constant d_{11} .

(c) The mode diameter of the quartz type optical fibers is
substantially the same as the mode diameter of the optical
waveguide.

Support for (a) can be found, for example, in Fig.2 and
paragraph [0021] of the original application (paragraph number

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refers to the US publication) or specification paragraph bridging pages 8-9.

Support for (b) can be found, for example, in paragraph [0025] and [0030] of the original application (paragraph number refers to the US publication) or specification page 10, last paragraph and page 12, second paragraph, respectively .

Support for (c) can be found, for example, in paragraph [0030] of the original application (paragraph number refers to the US publication) or specification page 12, second paragraph.

In the invention as now claimed, it is possible to make the mode diameter of the optical waveguide and the mode diameter of optical fiber substantially the same, because the refractive index of the quartz type optical fiber and the refractive index of the quasi-phase matched quartz crystal are very close. As a result, it is possible to reduce connection loss between waveguide and optical fiber and refractive loss. Therefore, it is possible to provide a high efficiency wavelength converter compared with conventional wavelength converters. (As mentioned paragraph [0021] (paragraph bridging pages 8-9), by using conventional material, it is difficult to make mode diameter match, or even if it is possible, refraction loss can not be

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reduced in this situation.)

The merit of combination of quartz type optical fiber and waveguide-type quasi-phase matched quartz crystal was discovered by the inventors and it is not obvious in the art. More specifically, combining the secondary art with Kurimura does not show or suggest this feature.

Kurimura et al. discloses bulk-type quasi-phase matched quartz crystal. However it does not disclose anything about waveguide-type quasi-phase matched quartz crystal. Further, the effects mentioned in Kurimura et al. are different from the above-mentioned effects of claim 1. The wavelength converter of claim 1 is different from quasi-phase matched quartz crystal for ultraviolet wave length converter described in Kurimura et al.

Furthermore, none of the secondary art (Onishi et al., Matsusita et al. and Mizuuchi et al.) disclose or suggest the missing technical features of the invention as claimed. Therefore, combining their teaching with Kurimura does not supply the missing teaching.

The remaining claims depend from claim 1 and are patentable with claim 1.

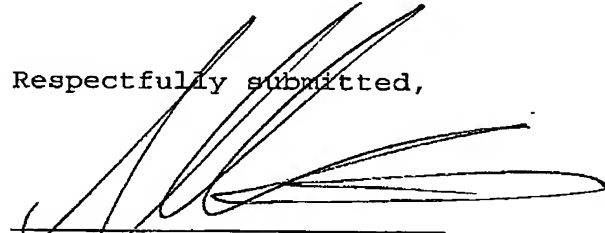
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In view of the above, it is submitted that the present invention is not shown or suggested by the cited art. Withdrawal of the rejections and allowance of the application are respectfully requested.

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